



National Aeronautics and Space Administration

# February Is for Remembrance

*It Has Happened to Us. . .  
It Happened to Them. . .  
It Can Happen to Us Again. . .*

## Senior Management ViTS Meeting

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# I. It has happened to us. . .



**Apollo 1 Fire** – Jan 21, 1967  
Gus Grissom, Ed White and  
Roger Chaffee (Source: NASA)



**X-15 Departure from Controlled Flight**  
– Nov 15, 1967 USAF Maj. Mike Adams  
(Source: NASA)



**Challenger Loss**– Jan 28, 1986  
Christa McAuliffe, Greg Jarvis, Judith Resnik,  
Dick Scobee, Ronald McNair , Mike Smith and  
Ellison Onizuka (Source: NASA)



**Columbia Loss**– Feb 1, 2003  
Kalpana Chawla, Rick Husband, Laurel Clark,  
Ilan Ramon, David Brown, William McCool  
and Michael Anderson (Source: NASA)

## II. It happened to them. . . \*

Gulf of Mexico, near the Mississippi River Delta, April 20, 2010, approximately 7:45 p.m. CDT (T-minus 7:00 hours prior to the blowout): four BP/Transocean VIPs fly onboard rig for a Management Visibility Tour to meet and talk with workers. No agenda except to credit the crew for seven years with no lost time injuries, and check workplace conditions for occupational hazards found recently on other rigs. Deepwater Horizon seemed to them to be a top safety performer, and at least one VIP wanted to learn why. During the next 7 hours, two indications would appear that the well was not sealed and was at risk of the worst blowout and spill in US history. The VIPs would miss them both.

### Informal Probing of Workplace Safety

- Before touring the rig, the VIPs visited the bridge to credit the marine crew for their work—a group often omitted on such tours.
- During the tour, one VIP inspected fall protection harness conditions and storage.
- Another checked for a slip hazard identified on another rig.
- Members spoke to crewmembers about the risk of hand injury, and of being struck by objects dropped from height, the topics of the latest Transocean/BP joint safety campaign.
- These managers clearly were focused on delivering a safety message and doing their own informal workplace hazard audits.
- Were they safety professionals? No. They were expert drilling engineers and former rig managers.
- In hindsight, the experienced managers might have caught two signs of impending disaster and intervened if their **focus of attention** had included actual well operations.

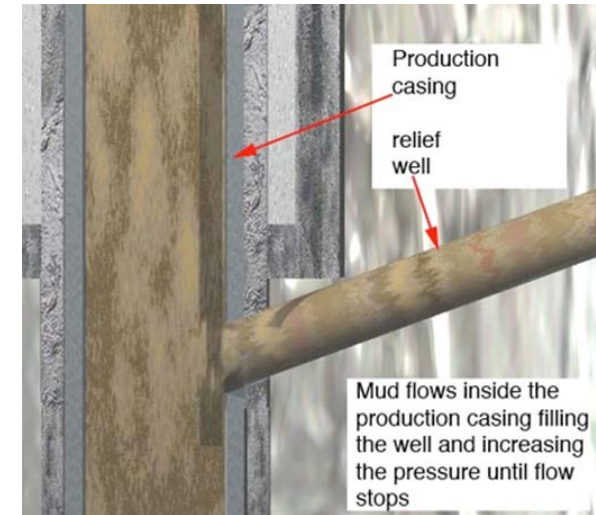
\* Management walk-arounds: Lessons from the Gulf of Mexico oil well blow-out  
By: Andrew Hopkins, Australian Safety Science Journal, 2011



## II. It happened to them. . . Missed Opportunities

### First Missed Opportunity

- Well safety while drilling is assured by keeping it full of mud, within a sealed casing and lining.
- The VIPs visited the rig's drilling shack, where the crew was discussing how they would do a pressure test to verify the seal and the meaning of the results.
- The BP man on the rig told the VIPs, "We're having a little trouble getting lined up [for the test] but it's no big deal." The BP VIP asked no questions, but talked about BP history with ARCO and in Alaska.
- **The rig crew performed the test and misinterpreted results**—mud was leaking which would allow flammable gas up into the rig and overwhelm installed control systems and explode. **Had they been attentive to the test**, managers could have recognized the error.



### Second Missed Opportunity

- Drilling was complete and mud was being replaced by seawater so the rig could move to its next assignment. **No one monitored to ensure the volume of seawater was matching the mud it replaced.** Too many other activities occupied the crew.
- **Transocean had narrowly averted a major North Sea blowout just 4 months earlier while replacing mud with seawater.** The North Sea crew lost track of mud flow and seawater volume. Transocean wrote a ten-page advisory warning against complacency at this critical time—the VIPs were unaware of this event.

## II. It happened to them. . . T- minus 0 -- Blowout

- Mud under pressure from the well shot all the way up the 20-story derrick and out of the degasser system, followed by gas under high pressure.
- There was an explosion, starting the first fire. Flames roared up and over the derrick.
- The devastation that followed **took the lives of eleven workers**, whose bodies were never recovered.
- **The four VIPs and one hundred eleven rig personnel were rescued.**
- Approximately **4.9 million barrels of oil were spilled**; as of February 2013, settlement payouts cost **\$42.2 billion**.



## II. It happened to them. . . In retrospect

- Hopkins hypothesized that the VIPs were singularly focused on personnel safety and hazards (e.g., slips, trips & falls) that contributed to personnel injury. After all, they and other safety professionals (including us) routinely measure, collect and report lost time and total case injury rates, comparing results with other industry leaders.
- They (and we) then reach some conclusions about the overall health of the total safety system performance from those measures.
- And while these measures are important, **they are not informative nor useful in helping us (or others) assess the adequacy of process safety management efforts.**



### III. *It can happen to us again. . . Scenario ID*

- As owners, operators and maintainers of high energy facilities, systems and equipment, it is incumbent for us to not only check the health of our institutional safety programs, but to also think about the high-severity, low-probability catastrophes that could happen at our Centers, or on our programs and do some deeper level probing. For example,
- It would be a really bad day at My Center – (or my program/project) if:
  - I were to lose utilities for an extended amount of time requiring my workforce and operations to cease;
  - These PV systems, boilers, LN<sub>2</sub> tanks, LOX system or hypergolic vessels were to fail/rupture;
  - We were to lose an aircraft and crew due to weather, system malfunction, collision, etc.
  - A fire or ammonia leak on the ISS were to occur;
  - Communication to my spacecraft were disrupted for a month;
  - One of my employees flies a UAS into the NAS, causing an evasive maneuver and subsequent crash by a commercial airliner;
  - A balloon payload were to injure the public;
  - Orbital debris from a NASA spacecraft were to injure the public;
  - We didn't dig into an unexplained anomaly. . . we didn't stay hungry;
  - Your scenario here...

### III. *It can happen to us again. . . Mitigation Check*

- I would suggest then as Center or facility visits occur, we ask questions like these to help show our support, awareness and emphasis on this vitally important piece of the larger safety agenda:
  1. For our utility systems: what is the state of health of protective relay calibration and maintenance? Do we have critical pieces of hardware operating significantly beyond their intended service life without a plan for replacement?
  2. What is the state of system or facility operator training? Are there checks in place to ensure people remain current? How well practiced are contingency/emergency procedures?
  3. For my Mishap Preparedness Contingency Plan: is it just based on the most likely scenario under full NASA control, or does it anticipate off-site injury/damage scenarios where NASA will need to coordinate or leverage the resources of others?
  4. Have Center employees been routinely briefed about Center sirens, alarms, etc. and do they know how/when to shelter in place vs. evacuating so that collateral damage (during the “bad day” event) is minimized?
  5. How well is the Airworthiness Safety Review process occurring at my Center? Are there issues with aircraft maintenance and pilots getting enough flight hours in to maintain currency? Are the aircraft maintenance personnel keeping current with the qualifications necessary to safely perform their functions?
  6. Is there adequate oversight by my safety committees to ensure that we don’t have process escapes (UAS in the NAS scenario)? How do I know?



### III. It can happen to us again. . . Final Thoughts

- There is little doubt that for any organization that suffers these horrible mishaps that there is a never-ending sense of remorse.
- However, I believe that if we can use these past failures as an opportunity to re-commit ourselves to identify our collective “bad day” events and ensure the necessary contingency plans and mitigations are in place and healthy, we can honor those who paid the ultimate sacrifice and **assure mission success today**.

